**Definition:-** Let $(X,d)$ be a metric space and let $r$ be a positive number a neighbourhood of a point $p \in X$, the set of all points $x \in X \ni d(p,x)$. and is denoted by $N_r(p)$

$$\therefore N_r(p) = \{x \in X : d(p,x) < r\}$$

**Example:-** let $(R,d)$ be the usual metric space $r=5$, $p=2$

sol:

$$N_r(p) = \{x \in X : d(p,x) < r\}$$


$$N_5(2) = \{x \in R : d(2,x) < 5\}$$
$$= \{x \in R : |x-2| < 5\}$$
$$= \{x \in R : -5 < x-2 < 5\}$$
$$= \{x \in R : -3 < x < 7\}$$

Exc Find $N_3(-2)$

**Example :-** let $(R^2, d)$ beausual metric space.
Describle the niegbourhood of $(0,0)$ with radius 1.

Solutron :-

$$N_1(0,0) = \{(x,y) \in \mathbb{R}^2 : d(0,0)(x,y) < 1\}$$
$$= \{(x,y) \in \mathbb{R}^2 : \sqrt{(y-0)^2 + (x-0)^2} < 1\}$$
$$= \{(x,y) \in \mathbb{R}^2 : \sqrt{y^2 + x^2} < 1\}$$
$$= \{(x,y) \in \mathbb{R}^2 : y^2 + x^2 < 1\}$$

**Example :-** Let $(R^2, d)$ be ausual metric space when $d$ is ametric on $R^2$ defined by $d(x_1, x_2)(y_1, y_2) = |y_1 - x_1| + |y_2 - x_2|$ Describle The nieghourhood of $(0,0)$ with radius 1.

Solution :- $$N_1(0,0) = \{(x,y) \in \mathbb{R}^2 : d(0,0)(x,y) < 1\}$$
$$= \{(x,y) \in \mathbb{R}^2 : |x-0| + |y-0| < 1\}$$
$$= \{(x,y) \in \mathbb{R}^2 : |x| + |y| < 1\}$$